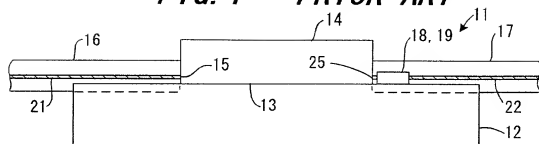
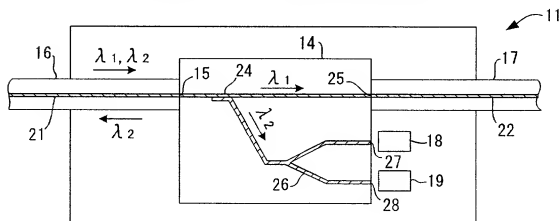


FIG. 1 PRIOR ART

11: WAVELENGTH MULTIPLEXING OPTICAL
COMMUNICATION MODULE
12: SILICON SUBSTRATE
13: UPPER SURFACE
14: OPTICAL WAVEGUIDE
15: OPTICAL CIRCUIT PORT

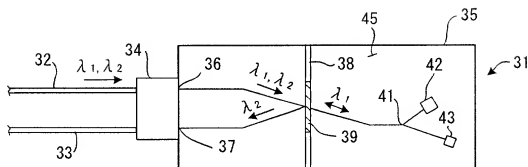
16: I/O PORT OPTICAL FIBER
17: OPTICAL FIBER
18: PHOTODIODE (PD) MODULE
19: LASER DIODE MODULE
21, 22: CORE
25: OPTICAL OUTPUT PORT

FIG. 2 PRIOR ART

λ_1, λ_2 : WAVELENGTH
11: WAVELENGTH MULTIPLEXING OPTICAL
COMMUNICATION MODULE
12: SILICON SUBSTRATE
14: OPTICAL WAVEGUIDE
15: OPTICAL CIRCUIT PORT
16: I/O PORT OPTICAL FIBER
17: OPTICAL FIBER
18: PHOTODETECTOR

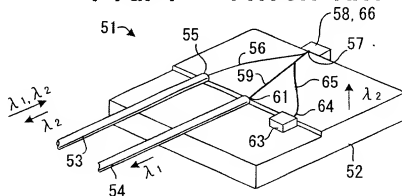
19: LASER DIODE (LD) MODULE
21, 22: CORE
24: MULTIPLEXING/DEMULTIPLEXING
SECTION IN OPTICAL CIRCUIT
25: OPTICAL OUTPUT PORT
26: BRANCHING SECTION
27, 28: PORT

FIG. 3 PRIOR ART



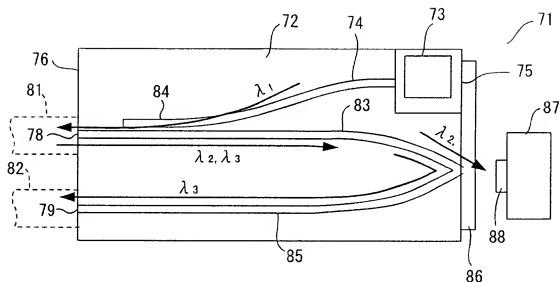
- λ_1, λ_2 : WAVELENGTH
 31: WAVELENGTH MULTIPLEXING OPTICAL COMMUNICATION MODULE
 32: SINGLE MODE OPTICAL FIBER FOR INPUT
 33: OPTICAL FIBER FOR OUTPUT
 34: GLASS BLOCK
 35: OPTICAL WAVEGUIDE
 36, 37: I/O PORT
 38: GROOVE
 39: DIELECTRIC MULTI-LAYER FILM
 41: BRANCHING SECTION
 42: LASER DIODE MODULE
 43: PHOTO DIODE MODULE
 45: REFERENCE PLANE OF PLANAR OPTICAL WAVEGUIDE CIRCUIT

FIG. 4 PRIOR ART



- λ_1, λ_2 : WAVELENGTH
 51: WAVELENGTH MULTIPLEXING OPTICAL COMMUNICATION MODULE
 52: OPTICAL WAVEGUIDE SUBSTRATE
 53: 1ST OPTICAL FIBER
 54: 2ND OPTICAL FIBER
 55: 1ST PORT
 56: 1ST OPTICAL WAVEGUIDE
 57: 2ND PORT
 58: WAVELENGTH DEMULTIPLEXING ELEMENT
 59: 2ND OPTICAL WAVEGUIDE
 61: 3RD PORT
 63: LASER DIODE MODULE
 64: 4TH PORT
 65: 3RD OPTICAL WAVEGUIDE
 66: PHOTODETECTOR FOR OPTICAL OUTPUT MONITOR

FIG. 5



$\lambda_1, \lambda_2, \lambda_3$: WAVELENGTH

71: WAVELENGTH MULTIPLEXING OPTICAL COMMUNICATION MODULE

72: OPTICAL WAVEGUIDE SUBSTRATE

73: LIGHT EMITTING DEVICE

74: 1ST OPTICAL WAVEGUIDE

75, 76: END FACE

78: 1ST PORT

79: 2ND PORT

81: 1ST OPTICAL FIBER

82: 2ND OPTICAL FIBER

83: 2ND OPTICAL WAVEGUIDE

84: DIRECTIONAL COUPLER

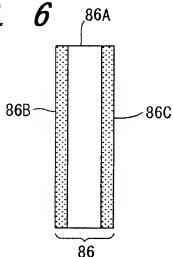
85: 3RD OPTICAL WAVEGUIDE

86: WAVELENGTH FILTER

87: CARRIER

88: PHOTODETECTOR FOR RECEPTION

FIG. 6

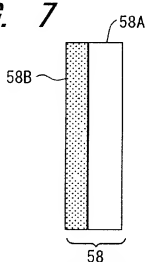


86: WAVELENGTH FILTER

86A: GLASS SUBSTRATE

86B, 86C: DIELECTRIC MULTI-LAYER FILM

FIG. 7

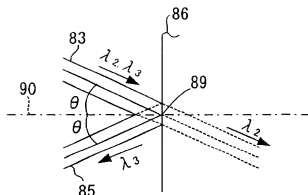


58: WAVELENGTH DEMULTIPLEXING ELEMENT

58A: HALF MIRROR

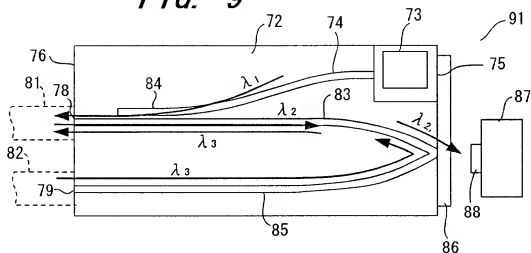
58B: DIELECTRIC MULTI-LAYER FILM

FIG. 8



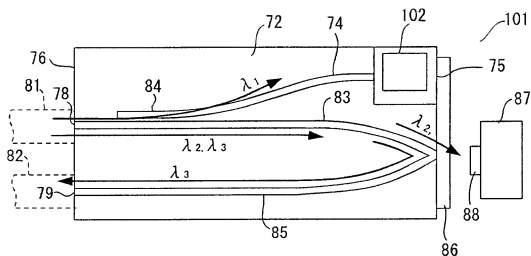
λ_2, λ_3 : WAVELENGTH
 θ : ANGLE
 83: 2ND OPTICAL WAVEGUIDE
 85: 3RD OPTICAL WAVEGUIDE
 86: WAVELENGTH FILTER
 89: IDENTICAL POINT
 90: LINE

FIG. 9



$\lambda_1, \lambda_2, \lambda_3$: WAVELENGTH	83: 2ND OPTICAL WAVEGUIDE
72: OPTICAL WAVEGUIDE SUBSTRATE	84: DIRECTIONAL COUPLER
73: LIGHT EMITTING DEVICE	85: 3RD OPTICAL WAVEGUIDE
74: 1ST OPTICAL WAVEGUIDE	86: WAVELENGTH FILTER
75, 76: END FACE	87: CARRIER
78: 1ST PORT	88: PHOTODETECTOR FOR RECEPTION
79: 2ND PORT	91: WAVELENGTH MULTIPLEXING OPTICAL COMMUNICATION MODULE
81: 1ST OPTICAL FIBER	
82: 2ND OPTICAL FIBER	

FIG. 10



$\lambda_1, \lambda_2, \lambda_3$: WAVELENGTH

72: OPTICAL WAVEGUIDE SUBSTRATE

74: 1ST OPTICAL WAVEGUIDE

75, 76: END FACE

78: 1ST PORT

79: 2ND PORT

81: 1ST OPTICAL FIBER

82: 2ND OPTICAL FIBER

83: 2ND OPTICAL WAVEGUIDE

84: DIRECTIONAL COUPLER

85: 3RD OPTICAL WAVEGUIDE

86: WAVELENGTH FILTER

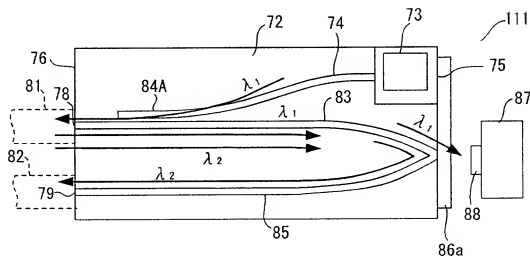
87: CARRIER

88: PHOTODETECTOR FOR RECEPTION

101: WAVELENGTH MULTIPLEXING OPTICAL
COMMUNICATION MODULE

102: PHOTODETECTOR

FIG. 11

 λ_1, λ_2 : WAVELENGTH

72: OPTICAL WAVEGUIDE SUBSTRATE

73: LIGHT EMITTING DEVICE

74: 1ST OPTICAL WAVEGUIDE

75, 76: END FACE

78: 1ST PORT

79: 2ND PORT

81: 1ST OPTICAL FIBER

82: 2ND OPTICAL FIBER

83: 2ND OPTICAL WAVEGUIDE

84A: DIRECTIONAL COUPLER

85: 3RD OPTICAL WAVEGUIDE

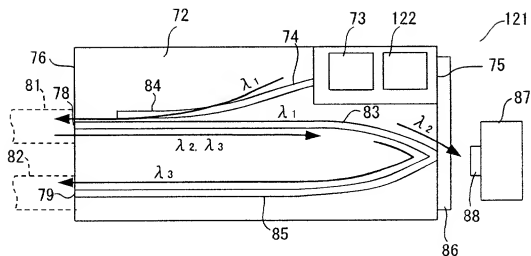
86a: WAVELENGTH FILTER

87: CARRIER

88: PHOTODETECTOR FOR RECEPTION

111 : WAVELENGTH MULTIPLEXING OPTICAL
COMMUNICATION MODULE

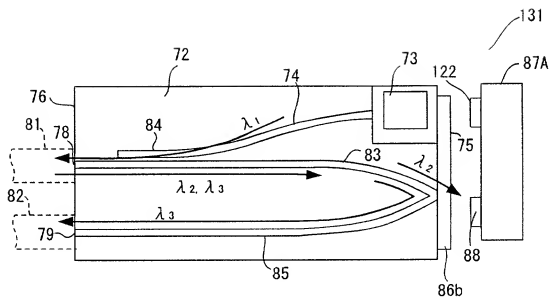
FIG. 12



$\lambda_1, \lambda_2, \lambda_3$: WAVELENGTH
 72: OPTICAL WAVEGUIDE SUBSTRATE
 73: LIGHT EMITTING DEVICE
 74: 1ST OPTICAL WAVEGUIDE
 75, 76: END FACE
 78: 1ST PORT
 79: 2ND PORT
 81: 1ST OPTICAL FIBER

82: 2ND OPTICAL FIBER
 83: 2ND OPTICAL WAVEGUIDE
 84: DIRECTIONAL COUPLER
 85: 3RD OPTICAL WAVEGUIDE
 86: WAVELENGTH FILTER
 87: CARRIER
 88: PHOTODETECTOR FOR RECEPTION
 121: WAVELENGTH MULTIPLEXING OPTICAL COMMUNICATION MODULE
 122: PHOTODETECTOR FOR MONITORING

FIG. 13



$\lambda_1, \lambda_2, \lambda_3$ = WAVELENGTH

72: OPTICAL WAVEGUIDE SUBSTRATE

73: LIGHT EMITTING DEVICE

74: 1ST OPTICAL WAVEGUIDE

75, 76: END FACE

78: 1ST PORT

79: 2ND PORT

81: 1ST OPTICAL FIBER

B2: 2ND OPTICAL FIBER

B3: 2ND OPTICAL WAVEGUIDE

84: DIRECTIONAL COUPLER

85: 3RD OPTICAL WAVEGUIDE

86b: WAVELENGTH FILTER

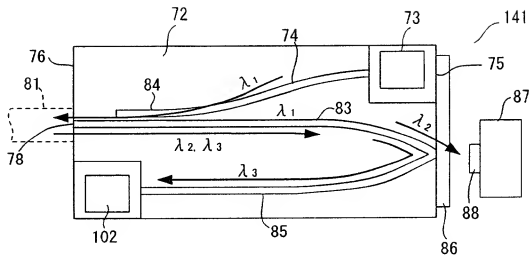
87A: CARRIER

88: PHOTODETECTOR FOR RECEPTION

122: PHOTODETECTOR FOR MONITORING

131: WAVELENGTH MULTIPLEXING OPTICAL COMMUNICATION MODULE

FIG. 14



$\lambda_1, \lambda_2, \lambda_3$: WAVELENGTH
 72: OPTICAL WAVEGUIDE SUBSTRATE
 73: LIGHT EMITTING DEVICE
 74: 1ST OPTICAL WAVEGUIDE
 75, 76: END FACE
 78: 1ST PORT
 81: 1ST OPTICAL FIBER
 83: 2ND OPTICAL WAVEGUIDE

84: DIRECTIONAL COUPLER
 85: 3RD OPTICAL WAVEGUIDE
 86: WAVELENGTH FILTER
 87: CARRIER
 88: PHOTODETECTOR FOR RECEPTION
 102: PHOTODETECTOR
 141: WAVELENGTH MULTIPLEXING OPTICAL COMMUNICATION MODULE